STANDARDS CHANGES CATALOG (SCC)

SCC NUMBER: SCC #140

CHANGE PROPOSAL TITLE: Segmentation/Reassembly (S/R) Header: Byte Order of Transmission Clarification

ORIGINATOR and ADDRESS: Steve Turczyn
Army Representative
stephen.turczyn@mail1.monmouth.army.mil
732-532-8453; DSN 992-8453

Ketan Patel
Marine Corps Representative
patelkk@mctssa.usmc.mil
760-725-2374; DSN: 365-2374

Bob Lynch
CNRWG Facilitator
robert.j.lynch@us.army.mil
732-532-7582; DSN: 992-7582

ORIGINATOR'S INTERNAL NUMBER:

AFFECTED DOCUMENT: MIL-STD-2045-47001C

PRECEDENCE: Priority

RECOMMENDATIONS: Required for Army – Marine Corps interoperability.

RECORD OF PROCESSING

DATE:	ACTION:
03 Mar 03	Proposal
07 Mar 03	Work Item
07 Apr 03	R2; Draft
14 May 03	R3; Approved for MIL-STD-045-47001C

1. STATEMENT OF THE PROBLEM: The byte order of S/R header is ambiguous. The interface between the Army's Maneuver Control System (MCS) and the Marine Corps' Command & Control Personal Computer (C2PC) has raised the issue on the proper byte order of transmission of S/R header information. The CNRWG has been very careful in the standard to show byte order in every other case to avoid ambiguity. S/R escaped notice when examples with actual values were added.

2. PROBLEM ANALYSIS: Appendix C of MIL-STD-2045-47001 describes the S/R Protocol. This is a DoD unique protocol for segmenting 47001 messages larger than maximum segment size. The header itself is shown in standard User Datagram Protocol/Internet Protocol (UDP/IP) format where the information is shown in 32 bit blocks. The intent of MIL-STD-2045-47001 is that for transmission purposes the S/R Header be treated like standard UDP/IP headers. Once the header is created it is treated as a series of octets. The octets are therefore transmitted in Network Byte Order or most significant byte first. The underlying layers dictate actual bit order. If the S/R is transmitted under MIL-STD-188-220 then the bit order is Least Significant Bit (LSB) of the octet first.

3. PROPOSED SOLUTION: See attached pages.

4. ALTERNATIVE SOLUTIONS: None.

5. SYSTEM CHANGES REQUIRED: None.

6. CONFIGURATION ITEM DOCUMENTATION CHANGES: MIL-STD-2045-47001C. Note: *If one is using S/R in MIL-STD-2045-47001B then the example in MIL-STD-2045-47001C should be used for byte order clarification.* Since MIL-STD-2045-47001B will not be updated, a reference stating the first sentence in the above Note will be placed on the CNRWG website and on DoD's ASSIST database in the Document Part Description for downloading the PDF file for Revision B.

7. IMPACT ON INTEROPERABILITY: Improves interoperability because the S/R header byte order was previously ambiguous.

8. IMPACT ON RELATED DOCUMENTS: None.

9. IMPLEMENTATION DATES: When approved for C2PC.

10. OTHER CONSIDERATIONS: None.

11. REFERENCES: None.

12. Trouble Reports (TRs) ADDRESSED IN THIS SCC: None.

C.4.1 Common S/R Header.

Figure 7 depicts the S/R header that precedes all PDUs defined in this appendix. Each octet is marked to show MSB and LSB.

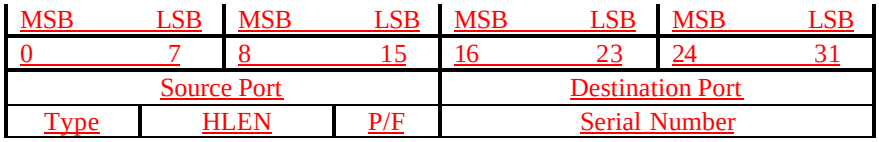

Figure 7. Segmentation/Reassembly header

~~Source Port~~ ~~Destination Port~~ ~~Type~~ ~~HLEN~~ ~~P/F~~ ~~Serial Number~~

~~**Figure 7. Segmentation/Reassembly header**~~

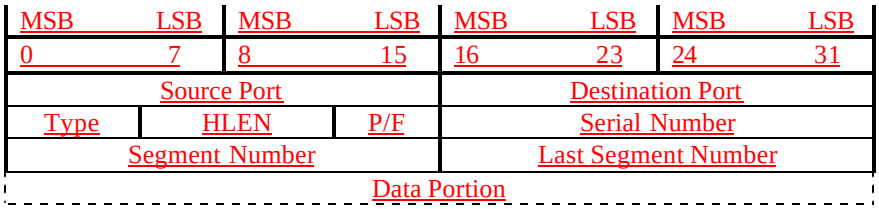

Figure 8. Data segment

~~Source Port~~ ~~Destination Port~~ ~~Type~~ ~~HLEN~~ ~~P/F~~ ~~Serial Number~~ ~~Segment Number~~ ~~Last Segment Number~~ ~~Data Portion~~ ~~Type = 000 or 010~~

~~**Figure 8. Data segment**~~

MSB LSB	MSB LSB	MSB LSB	MSB LSB
0 7	8 15	16 23	24 31
Source Port		Destination Port	
Type	HLEN P/F	Serial Number	
Starting Segment No.		Bit Map	Padded

Type = 100

Figure 9. Partial acknowledgement segment

~~Source Port~~		~~Destination Port~~	
~~Type~~	~~HLEN P/F~~	~~Serial Number~~	
~~Starting Segment No.~~		~~Bit Map~~	~~Padded~~

~~Type = 100~~

~~Figure 9. Partial acknowledgement segment~~

MSB LSB	MSB LSB	MSB LSB	MSB LSB
0 7	8 15	16 23	24 31
Source Port		Destination Port	
Type	HLEN P/F	Serial Number	

Type = 110

Figure 10. Complete acknowledgement segment

~~Source Port~~		~~Destination Port~~	
~~Type~~	~~HLEN P/F~~	~~Serial Number~~	

~~Type = 110~~

~~Figure 10. Complete acknowledgement segment~~

MSB LSB	MSB LSB	MSB LSB	MSB LSB
0 7	8 15	16 23	24 31
Source Port		Destination Port	
Type	HLEN P/F	Serial Number	

Type = 001 or 101

Figure 11. Abort request/confirm segment

Source Port			Destination Port
Type	HLEN	P/F	Serial Number

Type = 001 or 101

Figure 11. Abort request/confirm segment

MSB LSB	MSB LSB	MSB LSB	MSB LSB
0 7	8 15	16 23	24 31
Source Port			Destination Port
Type	HLEN	P/F	Serial Number
Last Segment Number			Padded

Type = 011

Figure 12. Acknowledgement request segment

Source Port			Destination Port
Type	HLEN	P/F	Serial Number
Last Sent Segment No.			Padded

Type = 011

Figure 12. Acknowledgement request segment

C4.8 Example.

The construction of the S/R header is illustrated by the example in TABLE SCC-140. The first four columns of the table provide a description of each field in the example, the field length in bits, and the value of the field in both decimal and binary representations. The last four columns show the physical encoding of the S/R header. In the fifth column, Field Fragments, the bits of each field are placed in octets. The bit(s) of each field are positioned in an octet such that the LSB of the field is positioned in the least significant unencoded bit of the octet, the next LSB of the field is placed in the next least significant unencoded bit of the octet, and repeated until all of the bits of the field have been encoded. When an octet is filled before all the bits of a field are encoded, the process is continued by encoding the next octet with the remaining bits of the field. This field/octet encoding procedure is performed starting with the first field and octet, and repeated for each successive field and individual octet, in order, until the encoding is completed. When a field has groups, the field encoding procedure is performed starting with the first group, and repeated for each successive group and individual octet, in order, until the encoding of the field is completed. The Target Number field illustrates the encoding of a field with groups. Note the LSB of a field or octet is defined as the bit having the weight of 2^0 when the field or octet is represented as a numeric value. X's are used to identify bits that are not associated with the field being encoded. The sixth column, Octet Value - Binary, assembles the bits contributed by successive fields into complete octets, represented in binary. The seventh column, Octet Value - Hexadecimal, represents the octet value in hexadecimal. The last column, Octet Number, numbers the octets from first to last starting with 0.

Each S/R header is individually encoded. For this example, the Source has a value of 5000, the Destination has a value of 1581, the Type equals 2, HELEN equals 3, P/F equals 1, Serial Number has a value of 16000, Segment Number has a value of 260 and the Last Segment Number equals 300.

TABLE SCC-140. Example construction of S/R header data

FIELD				OCTET BUFFER/STREAM			
TITLE	LENGTH (Bits)	VALUE (Dec)	VALUE (Binary) MSB 2^n LSB 2^0	FIELD FRAGMENTS MSB 2^7 LSB 2^0	OCTET VALUE (Binary) MSB 2^7 LSB 2^0	OCTET VALUE (Hex)	OCTET NO
Source Port	16	5000	0001001110001000	00010011	00010011	13	0
				10001000	10001000	88	1
Destination Port	16	1581	0010110100000110	00000110	00000110	06	2
				00101101	00101101	2D	3
Type	3	2	010	010XXXXX			
HLEN	12	3	000000000011	XXX00000	01000000	40	4
				0000011X			
P/F	1	1	1	XXXXXXX1	00000111	07	5
Serial Number	16	16000	0011111010000000	00111110	00111110	3E	6
				10000000	10000000	80	7
Segment Number	16	260	0000000100000100	00000001	00000001	01	8
				00000100	00000100	04	9
Last Segment Number	16	300	0000000100101100	00000001	00000001	01	10
				00101100	00101100	2C	11